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EXAMINER	
KUMAR, PANKAJ	

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2631	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/919,191	ONGGOSANUSI ET AL.	
	Examiner	Art Unit	
	Pankaj Kumar	2631	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *31 July 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-37* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9,16,19-26,33,34 and 37* is/are rejected.

7)☒ Claim(s) *10-15,17,18,27-32,35 and 36* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *6,8/02;7,10/01*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 16, 19, 22, 23, 34, 37 are rejected under 35 U.S.C. 102(b) as being anticipated by Robertson IEEE Feb. 1998 vol. 16 no. 2 pages 206-218. Here is how the reference teaches the claim:

3. As per claim 16: A parallel concatenated trellis-coded modulation apparatus, comprising: an input for receiving uncoded bits from a communication application (Robertson fig. 1: third and fourth inputs of top signal mapper); a first coder (Robertson fig. 1: top encoder including adders, delays, etc.) coupled to said input (Robertson fig. 1: inputs into top encoder is same as third and fourth inputs of top signal mapper) for producing coded bits from said uncoded bits (Robertson fig. 1: output of top encoder); an interleaver coupled to said input (Robertson fig. 1: left two inputs of the interleaver are coupled to said input) for producing from said uncoded bits an interleaved version of said uncoded bits (Robertson fig. 1: left two outputs of the interleaver); a second coder (Robertson fig. 1: bottom encoder including adders, delays, etc.) coupled to said interleaver (Robertson fig. 1: bottom two inputs of bottom signal mapper are the same as the inputs into the bottom encoder which is from the interleaver) for producing an interleaved version of said coded bits from the interleaved version of said uncoded bits (Robertson fig. 1: bottom input into bottom signal mapper is coded and interleaved, and its input is from the bottom

encoder which is after the interleaver); a first mapper coupled to said first coder (Robertson fig. 1: top signal mapper's bottom input is coupled to the top encoder's output) for applying a first coded bits-to-signal mapping to said coded bits to produce a first output signal (Robertson fig. 1: output of top signal mapper); and a second mapper coupled to said second coder (Robertson fig. 1: bottom signal mapper's bottom input is coupled to the bottom encoder's output) for applying a second coded bits-to-signal mapping to the interleaved version of said coded bits to produce a second output signal (Robertson fig. 1: output of bottom signal mapper), wherein said second coded bits-to-signal mapping differs from said first coded bits-to-signal mapping (Robertson fig. 1: top and bottom mappers are different at least because of different inputs).

4. As per claim 19: The apparatus of Claim 16, wherein said first and second coders each implement an identical (Robertson fig. 1: top and bottom encoders are identical) recursive systematic component code (Robertson fig. 1: top and bottom encoders have the output of the last nT being fed back to other components with the system as indicated by the arrows).

5. As per claim 22: The apparatus of Claim 16, wherein said first mapping is set partition mapping (Robertson page 208 first column last paragraph: encoder ...set partitioning; see fig. 3).

6. As per claim 23: The apparatus of Claim 16, wherein said first mapper and said second mapper each implement one of QPSK mapping (Robertson page 210 second column, 7^{th} line from the bottom: QPSK; top right of fig. 3: only elements 0, 2, 4 and 6 comprise QPSK with the mapper on the left) and 8PSK mapping (Robertson page 208 first column last paragraph: encoder...8-PSK signaling...set partitioning; top right of fig. 3: elements 0-7 comprise 8-PSK with the mapper on the left).

7. As per claim 34: A method of performing parallel concatenated trellis-coded modulation, comprising: receiving uncoded bits from a communication application (Robertson fig. 1: third and fourth inputs of top signal mapper); encoding said uncoded bits to produce coded bits (Robertson fig. 1: output of top encoder); interleaving said uncoded bits to produce an interleaved version of said uncoded bits (Robertson fig. 1: left two outputs of the interleaver); encoding the interleaved version of said uncoded bits to produce an interleaved version of said coded bits (Robertson fig. 1: bottom encoder which is after the interleaver); applying a first coded bits-to-signal mapping to said coded bits (Robertson fig. 1: top signal mapper's bottom input is coupled to the top encoder's output) to produce a first output signal (Robertson fig. 1: output of top signal mapper); and applying a second coded bits-to-signal mapping to the interleaved version of said coded bits (Robertson fig. 1: bottom signal mapper's bottom input is coupled to the bottom encoder's output) to produce a second output signal (Robertson fig. 1: output of bottom signal mapper), wherein said second coded bits-to-signal mapping differs from said first coded bits-to-signal mapping (Robertson fig. 1: top and bottom mappers are different at least because of different inputs).

8. As per claim 37: The method of Claim 34, wherein said encoding steps each implement an identical (Robertson fig. 1: top and bottom encoders are identical) recursive systematic component code (Robertson fig. 1: top and bottom encoders have the output of the last nT being fed back to other components with the system as indicated by the arrows).

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 20, 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Robertson IEEE Feb. 1998 vol. 16 no. 2 pages 206-218. Here is how the reference teaches the claims:

11. As per claim 20: The apparatus of Claim 16, wherein said first mapping is one of Gray mapping (Robertson page 214, fig. 6: Gray mapping), 0231 mapping and 0213 mapping.

12. Robertson does not teach that its Gray mapping, 0231 mapping and 0213 mapping is the first mapping. Robertson does teach a comparison of its TTCM scheme with Gray mapping as in page 215 and concludes that its TTCM scheme is better than Gray mapping. However, since Robertson teaches that it measures the error rate to be higher with the Gray mapping than its TTCM scheme for the same signal to noise ratio (as in Robertson's fig. 6 and pg 215), Robertson is teaching that its mappers were being used for Gray mapping in the multiple mappers in order to get the result it did for the comparison in figure 6. The office takes official notice that when a reference teaches mappers and recites Gray mapping, that the reference is using Gray mapping through all of its mappers, especially since it wants to compare different types of mappers. Also, applicant's specification teaches that 0231 mapping is prior art (applicant's spec. background of the invention fig. 6) and that different mappings can be used with various mapping examples (applicant's spec. background of the invention pg. 5 lines 5–6, pg. 6 lines 5-6) and accordingly,

0213 mapping is a different type of mapping. Thus, it would have been obvious, to one of ordinary skill in the art, at time the invention was made, to modify the prior art teaching of Robertson with the first mapping being Gray mapping, 0231 mapping and 0213 mapping as indicated by the instant claims, because Robertson teaches to compare Gray mapping with its own TTCM scheme, and Robertson and applicant's background of the invention teach that various other mappings can be used especially if, as pointed out in Robertson, one type of mapping has a lower error rate for same signal to noise ratio than another type of mapping (as in Robertson's fig. 6 and pg 215) in the analogous art of trellis coded modulation.

13. As per claim 21: The apparatus of Claim 20, wherein said second mapping is another of Gray mapping (Robertson page 214, fig. 6: Gray mapping), 0231 mapping and 0213 mapping. Robertson does not teach that its Gray mapping, 0231 mapping and 0213 mapping is the second mapping. Robertson does teach a comparison of its TTCM scheme with Gray mapping as in page 215 and concludes that its TTCM scheme is better than Gray mapping. However, since Robertson teaches that it measures the error rate to be higher with the Gray mapping than its TTCM scheme for the same signal to noise ratio (as in Robertson's fig. 6 and pg 215), Robertson is teaching that its mappers were being used for Gray mapping in the multiple mappers in order to get the result it did for the comparison in figure 6. The office takes official notice that when a reference teaches mappers and recites Gray mapping, that the reference is using Gray mapping through all of its mappers, especially since it wants to compare different types of mappers. Also, applicant's specification teaches that 0231 mapping is prior art (applicant's spec. background of the invention fig. 6) and that different mappings can be used with various mapping examples (applicant's spec. background of the invention pg. 5 lines 5–6, pg. 6 lines 5-6) and accordingly,

0213 mapping is a different type of mapping. Thus, it would have been obvious, to one of ordinary skill in the art, at time the invention was made, to modify the prior art teaching of Robertson with the second mapping being Gray mapping, 0231 mapping and 0213 mapping as indicated by the instant claims, because Robertson teaches to compare Gray mapping with its own TTCM scheme, and Robertson and applicant's background of the invention teach that various other mappings can be used especially if, as pointed out in Robertson, one type of mapping has a lower error rate for same signal to noise ratio than another type of mapping (as in Robertson's fig. 6 and pg 215) in the analogous art of trellis coded modulation.

14. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Robertson IEEE Feb. 1998 vol. 16 no. 2 pages 206-218 in view of Paik USPN 5,233,629. Here is how the reference teaches the claims:

15. As per claim 24: The apparatus of Claim 16, wherein said first mapper and said second mapper each implement one of 4-PAM mapping and 6-PAM mapping. Robertson teaches QAM, PSK but does not teach 4-PAM or 6-PAM. Paik teaches PAM (Paik col. 1 lines 22-42).

16. Thus, it would have been obvious, to one of ordinary skill in the art, at time the invention was made, to arrive at the 4-PAM or 6-PAM as recited by the instant claims, because the combined teaching of Robertson with Paik suggest mappers with mappings of 4-PAM and 6-PAM as recited by the instant claims. Furthermore, one of ordinary skill in the art, would have been motivated to combine the teachings of Robertson with Paik because Robertson suggests various mappings such as QAM and PSK (something broad) in general and Paik suggests the beneficial use of 16 bit QAM which has 4 levels or PAM mapping in general which include 4-

PAM and 6-PAM (such as QAM being a form of PAM and hence if QAM is used, it means PAM is used since QAM is in the same family as PAM) in the analogous art of mapping. Also, one would want to go to a different level of PAM such as 4PAM and 6PAM as tradeoffs over such parameters as bandwidth efficiency (Wei col. 1 line 35, col. 2 line 13), latency (Wei col. 1 line 43, col. 2 line 18), error rate (Wei col. 2 line 12) and coding gain (Wei col. 2 line 12).

17. Claims 1-7, 25, 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Robertson IEEE Feb. 1998 vol. 16 no. 2 pages 206-218 in view of Wei USPN 6,473,878. Here is how the reference teaches the claims:

18. As per claim 1: A communication transmission apparatus, comprising: a first input for receiving coded bits (Robertson fig. 1: bottom input into top signal mapper receiving m~ coded bits); a second input for receiving an interleaved version of said coded bits (Robertson fig. 1: bottom input into bottom signal mapper receiving m~ interleaved coded bits; Robertson does not teach interleaved version of said coded bits but it would be obvious for Robertson to teach this as explained below); a first mapper coupled to said first input for applying a first coded bits-to-signal mapping to said coded bits to produce a first output signal (Robertson fig. 1: top signal mapper); a second mapper coupled to said second input for applying a second coded bits-to-signal mapping to the interleaved version of said coded bits to produce a second output signal (Robertson fig. 1: bottom signal mapper), wherein said second coded bits-to-signal mapping differs from said first coded bits-to-signal mapping (Robertson fig. 1: top and bottom signal mappers are separate and have different types of inputs and thus differ from each other since the top signal mapper's input are not interleaved and the bottom signal mapper's inputs are

interleaved. But even if this is not enough to make the mappings different, it would be obvious to make them different as explained below.); and a communication channel interface coupled to said mappers for interfacing said output signals to a communication channel (Robertson fig. 1: output of signal mappers).

19. Robertson does not teach interleaved version of the coded bits. Wei teaches interleaved version of the coded bits (Wei fig. 108 is interleaving the coded bits from 106 and 107). Thus, it would have been obvious, to one of ordinary skill in the art, at time the invention was made, to arrive at the interleaved version of the coded bits as indicated by the instant claims, because the combined teaching of Robertson with Wei suggest a transmitter which has an interleaved version of the coded bits as recited by the instant claims. Furthermore, one of ordinary skill in the art, would have been motivated to combine the teachings of Robertson with Wei because Robertson suggests data entering the interleaver and then being encoded (something broad) in general and Wei suggests the beneficial use of encoded data entering the interleaver and then being encoded (such as achieving increased bit rate for a given level of error rate performance by using turbo codes whose concept is to encode input data and combine with an interleaver (Wei col. 1 lines 14-20)) in the analogous art of trellis coded modulation.

20. With respect to the limitation of said second coded bits-to-signal mapping differs from said first coded bits-to-signal mapping, Robertson teaches in fig. 1 that the top and bottom signal mappers are separate and have different types of inputs and thus differ from each other since the top signal mapper's input are not interleaved and the bottom signal mapper's inputs are interleaved. But even if this is not enough to make the mappings different, it would be obvious to make them different. It would have been obvious, to one of ordinary skill in the art, at time

the invention was made, to modify the prior art teaching of Robertson with the mappings being different as indicated by the instant claims, because Robertson suggests to compare different mapping schemes (as in Robertson's fig. 6 and pg 215) to see which one has a better error rate given the same signal to noise ratio and this comparison can be performed by having the top and bottom signal mappers have different mappings and then evaluating the output in the analogous art of mapping.

21. As per claim 2: The apparatus of Claim 1, wherein said communication channel interface is a wireless communication channel interface (Wei col. 1 line 13).

~~22.~~ As per claim 3: The apparatus of Claim 1, provided as one of a wireless telephone, a laptop computer and a personal digital assistant (these items are part of the teaching of Wei with wireless and other digital communication system provided in col. 1 lines 13-14:).

~~23.~~ As per claim 4: The apparatus of Claim 1 wherein said first mapping is one of Gray mapping (Robertson page 214, fig. 6: Gray mapping), 0231 mapping and 0213 mapping.

24. Robertson does not teach that its Gray mapping, 0231 mapping and 0213 mapping is the first mapping. Robertson does teach a comparison of its TTCM scheme with Gray mapping as in page 215 and concludes that its TTCM scheme is better than Gray mapping. However, since Robertson teaches that it measures the error rate to be higher with the Gray mapping than its TTCM scheme for the same signal to noise ratio (as in Robertson's fig. 6 and pg 215), Robertson is teaching that its mappers were being used for Gray mapping in the multiple mappers in order to get the result it did for the comparison in figure 6. The office takes official notice that when a reference teaches mappers and recites Gray mapping, that the reference is using Gray mapping through all of its mappers, especially since it wants to compare different types of mappers. Also,

applicant's specification teaches that 0231 mapping is prior art (applicant's spec. background of the invention fig. 6) and that different mappings can be used with various mapping examples (applicant's spec. background of the invention pg. 5 lines 5–6, pg. 6 lines 5-6) and accordingly, 0213 mapping is a different type of mapping. Thus, it would have been obvious, to one of ordinary skill in the art, at time the invention was made, to modify the prior art teaching of Robertson with the first mapping being Gray mapping, 0231 mapping and 0213 mapping as indicated by the instant claims, because Robertson teaches to compare Gray mapping with its own TTCM scheme, and Robertson and applicant's background of the invention teach that various other mappings can be used especially if, as pointed out in Robertson, one type of mapping has a lower error rate for same signal to noise ratio than another type of mapping (as in Robertson's fig. 6 and pg 215) in the analogous art of trellis coded modulation.

25. As per claim 5: The apparatus of Claim 4, wherein said second mapping is another of Gray mapping (Robertson page 214, fig. 6: Gray mapping), 0231 mapping and 0213 mapping. Robertson does not teach that its Gray mapping, 0231 mapping and 0213 mapping is the second mapping. Robertson does teach a comparison of its TTCM scheme with Gray mapping as in page 215 and concludes that its TTCM scheme is better than Gray mapping. However, since Robertson teaches that it measures the error rate to be higher with the Gray mapping than its TTCM scheme for the same signal to noise ratio (as in Robertson's fig. 6 and pg 215), Robertson is teaching that its mappers were being used for Gray mapping in the multiple mappers in order to get the result it did for the comparison in figure 6. The office takes official notice that when a reference teaches mappers and recites Gray mapping, that the reference is using Gray mapping through all of its mappers, especially since it wants to compare different types of mappers. Also,

applicant's specification teaches that 0231 mapping is prior art (applicant's spec. background of the invention fig. 6) and that different mappings can be used with various mapping examples (applicant's spec. background of the invention pg. 5 lines 5–6, pg. 6 lines 5-6) and accordingly, 0213 mapping is a different type of mapping. Thus, it would have been obvious, to one of ordinary skill in the art, at time the invention was made, to modify the prior art teaching of Robertson with the second mapping being Gray mapping, 0231 mapping and 0213 mapping as indicated by the instant claims, because Robertson teaches to compare Gray mapping with its own TTCM scheme, and Robertson and applicant's background of the invention teach that various other mappings can be used especially if, as pointed out in Robertson, one type of mapping has a lower error rate for same signal to noise ratio than another type of mapping (as in Robertson's fig. 6 and pg 215) in the analogous art of trellis coded modulation.

26. As per claim 6: The apparatus of Claim 1, wherein said first mapping is set partition mapping (Robertson page 208 first column last paragraph: encoder ...set partitioning).

27. As per claim 7: The apparatus of Claim 1, wherein said first mapper and said second mapper each implement one of QPSK mapping (Robertson page 210 second column, 7th line from the bottom: QPSK; top right of fig. 3: only elements 0, 2, 4 and 6 comprise QPSK with the mapper on the left) and 8PSK mapping (Robertson page 208 first column last paragraph: encoder...8-PSK signaling...set partitioning).

28. As per claim 25: A communication transmission method, comprising: receiving coded bits (Robertson fig. 1: top signal mapper's bottom input receiving coded bits) and an interleaved version of said coded bits (Robertson fig. 1: bottom signal mapper's bottom input receiving interleaved version of coded bits) (Robertson does not teach interleaved version of said coded

bits but it would be obvious as explained below); applying a first coded bits-to-signal mapping to said coded bits to produce a first output signal (Robertson fig. 1: applying top signal mapper to produce output of the top signal mapper), applying a second coded bits-to-signal mapping to the interleaved version of said coded bits to produce a second output signal (Robertson fig. 1: applying bottom signal mapper to produce output of the bottom signal mapper), wherein said second coded bits-to-signal mapping differs from said first coded bits-to-signal mapping (Robertson fig. 1: top and bottom signal mappers are separate and have different types of inputs and thus differ from each other since the top signal mapper's input are not interleaved and the bottom signal mapper's inputs are interleaved. But even if this is not enough to make the mappings different, it would be obvious to make them different as explained below.), and interfacing said output signals to a communication channel (Robertson title of IEEE journal: communications).

29. Robertson does not teach interleaved version of the coded bits. Wei teaches interleaved version of the coded bits (Wei fig. 108 is interleaving the coded bits from 106 and 107). Thus, it would have been obvious, to one of ordinary skill in the art, at time the invention was made, to arrive at the interleaved version of the coded bits as indicated by the instant claims, because the combined teaching of Robertson with Wei suggest a transmitter which has an interleaved version of the coded bits as recited by the instant claims. Furthermore, one of ordinary skill in the art, would have been motivated to combine the teachings of Robertson with Wei because Robertson suggests data entering the interleaver and then being encoded (something broad) in general and Wei suggests the beneficial use of encoded data entering the interleaver and then being encoded (such as achieving increased bit rate for a given level of error rate performance by using turbo

codes whose concept is to encode input data and combine with an interleaver (Wei col. 1 lines 14-20)) in the analogous art of trellis coded modulation.

30. With respect to the limitation of said second coded bits-to-signal mapping differs from said first coded bits-to-signal mapping, Robertson teaches in fig. 1 that the top and bottom signal mappers are separate and have different types of inputs and thus differ from each other since the top signal mapper's input are not interleaved and the bottom signal mapper's inputs are interleaved. But even if this is not enough to make the mappings different, it would be obvious to make them different. It would have been obvious, to one of ordinary skill in the art, at time the invention was made, to modify the prior art teaching of Robertson with the mappings being different as indicated by the instant claims, because Robertson suggests to compare different mapping schemes (as in Robertson's fig. 6 and pg 215) to see which one has a better error rate given the same signal to noise ratio and this comparison can be performed by having the top and bottom signal mappers have different mappings and then evaluating the output in the analogous art of mapping.

31. As per claim 26: The method of Claim 25, wherein said interfacing step includes interfacing said output signals to a wireless communication channel (Wei col. 1 line 13).

32. Claims 8, 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Robertson IEEE Feb. 1998 vol. 16 no. 2 pages 206-218 in view of Wei USPN 6,473,878 and further in view of Ko USPN 5,703,580. Here is how the reference teaches the claims:

33. As per claim 8: The apparatus of Claim 1, wherein said communication channel interface includes a combiner coupled to said first and second mappers for combining said first and second

output signals to produce a combined output signal for interfacing to the communication channel (Robertson does not teach this but it would be obvious as discussed below).

34. Robertson in view of Wei does not teach the combiner as claimed. Ko teaches the combiner as claimed by teaching said communication channel interface includes a combiner coupled to said first and second mappers for combining said first and second output signals to produce a combined output signal for interfacing to the communication channel (Ko fig. 8: outputs from the mappers are combined in 140 by converting from parallel to serial data.).

35. Thus, it would have been obvious, to one of ordinary skill in the art, at time the invention was made, to arrive at the combiner as recited by the instant claims, because the combined teaching of Robertson in view of Wei with Ko suggest a communication channel interface including a combiner coupled to the mappers as indicated by the instant claims. Furthermore, one of ordinary skill in the art, would have been motivated to combine the teachings of Robertson in view of Wei with Ko because Robertson in view of Wei suggests having two outputs out of the two mappers (something broad) in general and Ko suggests the beneficial use of combining the two outputs out of the two mappers (such as converting from parallel outputs to a serial output which would save resources by not having multiple elements receiving and only one element receiving) in the analogous art of encoding data.

36. As per claim 33: The method of Claim 25, wherein said interfacing step includes combining said first and second output signals to produce a combined output signal for interfacing to the communication channel (Robertson in view of Wei does not teach this but it would be obvious for it to teach this as explained below).

37. Robertson in view of Wei does not teach the combiner as claimed. Ko teaches the combiner as claimed by teaching said communication channel interface includes a combiner coupled to said first and second mappers for combining said first and second output signals to produce a combined output signal for interfacing to the communication channel (Ko fig. 8: outputs from the mappers are combined in 140 by converting from parallel to serial data.).

38. Thus, it would have been obvious, to one of ordinary skill in the art, at time the invention was made, to arrive at the combiner as recited by the instant claims, because the combined teaching of Robertson in view of Wei with Ko suggest a communication channel interface including a combiner coupled to the mappers as indicated by the instant claims. Furthermore, one of ordinary skill in the art, would have been motivated to combine the teachings of Robertson in view of Wei with Ko because Robertson in view of Wei suggests having two outputs out of the two mappers (something broad) in general and Ko suggests the beneficial use of combining the two outputs out of the two mappers (such as converting from parallel outputs to a serial output which would save resources by not having multiple elements receiving and only one element receiving) in the analogous art of encoding data.

39. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Robertson IEEE Feb. 1998 vol. 16 no. 2 pages 206-218 in view of Wei USPN 6,473,878 and further in view of Paik USPN 5,233,629. Here is how the reference teaches the claims:

40. As per claim 9: The apparatus of claim 1 wherein said first mapper and said second mapper each implement one of 4-PAM mapping and 6-PAM mapping (not in Robertson in view of Wei but would be obvious as explained below)

41. Robertson teaches QAM, PSK but does not teach 4-PAM or 6-PAM. Paik teaches PAM (Paik col. 1 lines 22-42).

42. Thus, it would have been obvious, to one of ordinary skill in the art, at time the invention was made, to arrive at the 4-PAM or 6-PAM as recited by the instant claims, because the combined teaching of Robertson in view of Wei with Paik suggest mappers with mappings of 4-PAM and 6-PAM as recited by the instant claims. Furthermore, one of ordinary skill in the art, would have been motivated to combine the teachings of Robertson in view of Weil with Paik because Robertson in view of Wei suggests various mappings such as QAM and PSK (something broad) in general and Paik suggests the beneficial use of 16 bit QAM which has 4 levels of PAM mapping in general which include 4-PAM and 6-PAM (such as QAM being a form of PAM and hence if QAM is used, it means PAM is used since QAM is in the same family as PAM) in the analogous art of mapping. Also, one would want to go to a different level of PAM such as 4PAM and 6PAM as tradeoffs over such parameters as bandwidth efficiency (Wei col. 1 line 35, col. 2 line 13), latency (Wei col. 1 line 43, col. 2 line 18), error rate (Wei col. 2 line 12) and coding gain (Wei col. 2 line 12).

Allowable Subject Matter

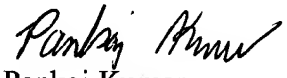
43. Claims 10-15, 17-18, 27-32, 35, 36 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

44. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Pankaj Kumar whose telephone number is (571) 272-3011. The examiner can normally be reached on Mon, Tues, Thurs and Fri after 8AM to after 6:30PM.

45. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad H. Ghayour can be reached on (571) 272-3021. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

46. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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PK